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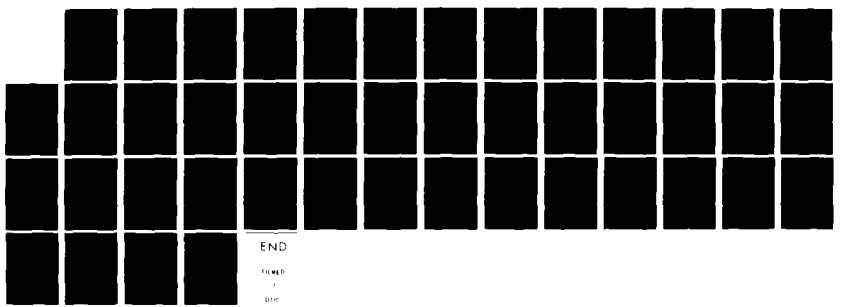

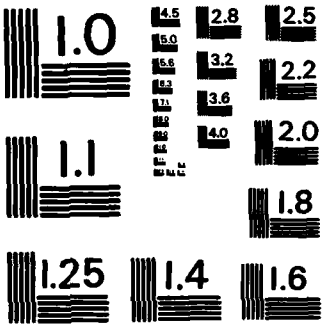

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This paper presents the total cost of conventional fuel used by U.S. Navy ships along with the data and methodology used to derive this value. The total cost of fuel consists of much more than the purchase price of a barrel of oil. Once. purchased, the fuel must be stored by fuel terminals and then delivered by fleet oilers to ships on station. These fleet oilers require the protection of ocean escorts since they have a limited self protec-

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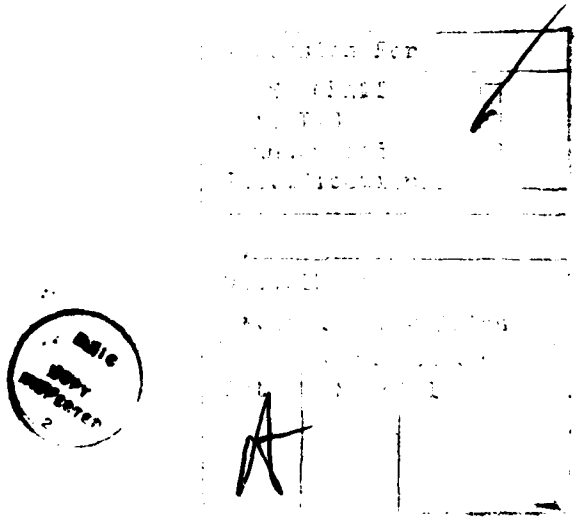
Block 20. Abstract (cont.)
tion capability. Due to the fact that the use of conventional fuel will be continued indefinitely into the future, consideration must be given to the replacement of fleet oilers and ocean escorts. All these factors contribute to the total cost of propulsion fuel used by conventionally powered U.S. Navy ships. The cost values and fuel delivery parameters used are based upon FY 80 data and therefore the basic fuel cost value is in FY 80 dollars. In addition to the derivation of a single fuel cost value, sensitivity analyses present the cost impacts due to variation in value of significant input values and/or assumptions.



A Study of the Total Cost of Conventional Ship Propulsion Fuel

COST ESTIMATING AND ANALYSIS DIVISION
NAVAL SEA SYSTEMS COMMAND
WASHINGTON, D.C.

JULY 1981

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1. Introduction/Background

The purpose of this study is to present the total cost of conventional fuel used by U.S. Navy ships for propulsion. This report is the result of a continuing effort by the NAVSEA Cost Estimating and Analysis Division to quantify the total cost of propulsion fuel used by Navy ships. The fuel costs, developed in past studies, have been used in the economic analysis of nuclear versus conventionally powered ships, in deriving the total cost of certain Naval operations and in design trade-offs of ship systems. This study provides updated information for use in these and similiar studies. To the greatest extent possible the fuel costs presented are analytically consistent with past fuel studies in order to facilitate the updating of analyses which previously relied on these fuel costs.

Although analytical consistency has been stressed in the performance of this study, the search for better data sources has been equally important. This search included review of the Defense Energy Information System (DEIS), the Navy Facilities Assets Data Base (NFADB), 3-M Maintenance Data System (MDS), Visability and Management of Operating and Support Cost-Ships (VAMOSC-SHIPS) management information system and Ships Parts Control Center information on oiler bulk fuel transfers. Review of these sources and the incorporation of data from them, has enhanced the validity of the inputs used in this Fuel Study. Also, for the first time, the cost of fuel storage and handling facilities has been included. The inclusion of this cost has increased the scope of this fuel study as compared with previous studies.

3. Storage and Handling Cost

The cost of fuel storage and handling consists of the imputed annual acquisition cost of storage and handling facilities, plus the operation and maintenance cost of these facilities, plus the cost of modernizing these facilities including the cost of improvements made for compliance with government regulations. The imputed annual acquisition cost of fuel storage and handling facilities is calculated for Navy owned and operated Defense Fuel Supply Points (DFSP) within the United States. NAVSUP identified these fuel terminals as being representative of all Navy terminals.

Table 1. Navy Owned and Operated Defense Fuel Supply Points in the United States

Adak, Alaska
Key West, Florida
Puget Sound, Washington
Norfolk, Virginia
Jacksonville, Florida
Charleston, South Carolina
Oakland, California
San Diego, California
Pearl Harbor, Hawaii

The acquisition cost of these facilities is obtained from the Detailed Inventory of Naval Shore Facilities. The Detailed Inventory of Naval Shore Facilities is an annual publication of the Navy Facilities Engineering Command.

Basically, the total cost of conventional propulsion fuel used by U.S. Navy ships consists of three major cost elements. These three cost elements are:

1. Purchase Price
2. Storage and Handling Cost
3. Delivery Cost

The methodology and data used to derive costs for each of these elements are described in the following sections of this report. The basic analysis consists of generating dollar values for each element of fuel cost in FY 80 dollars, on a cost per barrel basis. Fiscal year 1980 is the base year for this analysis. The FY 80 values are also inflated to "Then Year" dollars, through FY 2000, in Section 5 Sensitivity Analysis. Sensitivities are also presented for several of the major input data elements of this study. These sensitivities are performed recognizing that some data do not have a single valid value and/or that their value is the result of subjective analytical judgement.

2. Purchase Price

Purchase price is the direct cost for the propulsion fuel used by Navy ships. The DOD establishes stabilized rates for the various fuel products it uses to simplify the accounting procedures relating to fuel cost accounting. Since these rates are based upon the actual costs paid for fuel, the stabilized rates are used in this study. The stabilized rate for distillate fuel is the specific rate used in this study since it is the primary source of conventional ship propulsion fuel.

In February of 1980 the stabilized rate of distillate fuel was raised from $25.62 per barrel to $54.18 per barrel due to the increased cost to DOD for distillate fuel acquisition. Therefore the nominal value for fuel purchase price used in this study is $54.18 in FY 80 dollars.

This report is generated from the Navy Facilities Assets Data Base (NFADB) which is maintained by NAVFAC. The NFADB lists every facility at every Navy activity by a five digit function code. In order to determine depreciation costs NAVFAC has established the economic life in years for each facility code. The fifteen facility category codes which are of interest to this study are presented in Table 2 along with their description and economic life.

Table 2. Facility Category Codes

Category Code	Description	Economic Life (years)
12210	Marine Fueling Facility	38
12220	Small Craft Fueling Sta	38
12420	Drum/Can Ready Fuel Strg	25
12440	Sm Craft Ready Fuel Strg	25
12510	POL Pipeline	25
12516	Misc POL Pipeline Fac	25
12520	Shltr Misc Pipeline Fac	31
12610	Drum & Can Loading Facility	25
12630	Tank Truck/Car Load Fac	25
12640	Tank Truck/Car Unload Fac	25
14375	POL Opn/Sampling/Test Bldg	44
15140	Fueling Pier	38
15240	Fueling Wharf	38
41110	Ship Fuel Storage	38
41130	Diesel Fuel Storage	38

For each facility code at each Navy activity the NFADB gives, among many other data elements, the initial acquisition cost of the facility and the acquisition cost inflated to current year dollars.

All of the facility codes listed in Table 2 do not relate exclusively to storage and handling of ships propulsion fuel. For example, Petroleum, Oil and Lubricants (POL) pipeline costs would be related to all POL products, not just Diesel Fuel Marine (DFM). To obtain facility cost values for these types of facilities, the total facilities cost was multiplied by the ratio of DFM to POL issues. The DFM facilities cost values were then divided by the economic life of that type facility to obtain an annual DFM facilities cost value. The total annual DFM facilities cost was divided by the total number of barrels of DFM issued from the nine Navy owned and operated DFSP's in the United States to derive a cost per barrel of DFM.

The DFM and POL issues for FY 80 were obtained from the Defense Energy Information System (DEIS) which is maintained by the Defense Fuel Supply Command. The DEIS produces various monthly reports on fuel transfers for all Defense activities. Each report gives fuel transfers for the month and the cumulative values for the fiscal year. DEIS reports for the month of September 1980 were used to obtain the total DFM issues from each of the nine Navy DFSPs and the total DFM and total POL issues for all DFSPs. These were the fuel issue values which were used to generate facilities cost on a per barrel of DFM basis. The results of this DFM facilities cost analysis are presented in Table 3.

Table 3. DFM Facilities Cost Analysis Summary

Total DFM Facilities Cost	$408,226K
Total Annual DFM Facilities Cost	$ 11,371K
Total Barrels of DFM Issued	11,423K
Facilities Cost per Barrel of DFM	$ 1.00

In addition to the imputed value for facilities costs, the storage and handling cost also includes the cost of operating, maintaining, and modernizing the storage and handling facilities. These costs for FY 80 were obtained from the Naval Supply Systems Command for each of the nine Navy DFSP's used in this study. The total costs were allocated to DFM facilities in accordance with procedures also provided by NAVSUP. These DFM related costs were put on a per barrel of DFM basis by dividing them by the toal DFM issues which were obtained from the DEIS.

The total amount spent on operations and maintenance during FY 80 at Navy DFSP's, and the amount of DFM issued from them has remained essentially the same as they were for previous studies. Therefore, the O&M cost per barrel of fuel has remained essentially the same, showing only a very slight decrease. The amount that was spent during FY 80 on military construction, however, has decreased significantly when compared to previous studies. This is attributed to the facts that required construction for meeting pollution standards and for POL modernization have been completed. The cost per barrel of fuel for operations, maintenance and military construction at Navy DFSP's for FY 80 is $0.47. Combining this figure with the imputed facilities cost yields $1.47 per barrel of fuel for storage and handling during FY 80.

4. Delivery Cost

4.1. Overview

Fuel delivery cost consists of the imputed annualized acquisition cost and operating and support costs of oilers which deliver fuel to the fleet and the escort ships which provide protection to these oilers. Since oilers also deliver cargo other than ship propulsion fuel, the costs associated with these ships and their escorts must be prorated or allocated to the function of ship propulsion fuel delivery. Also, Navy ships do not receive all of their fuel from oilers; some fuel is received directly from fuel terminals. Receipt of fuel directly from a fuel terminal incurs no delivery cost. Therefore fuel delivery cost is normalized based upon the proportional amounts of fuel received at fuel terminals and that received from oilers during Underway Replenishment (UNREP). Finally, since the Navy will procure new oilers and escort ships, delivery costs are assessed on both a current and future fleet basis. Each of these aspects of fuel delivery cost are discussed in more detail in the following paragraphs. Also, Appendix C presents the delivery cost equations and calculations.

4.2. Ship Acquisition Cost

The ship acquisition cost includes the initial acquisition cost of the ship plus the cost of conversions and modernizations performed on the ship, expressed in FY 80 dollars. To put the acquisition cost on an annual basis, the total acquisition cost is divided by the economic life of the ship. As in past studies, the economic life of these ships is assumed to be thirty years. This value does not represent, nor should it be misconstrued to represent, the replacement value of the ship. The value used is essentially the annual depreciation of the ship expressed in FY 80 dollars. A summary of the annualized ship acquisition costs is presented in Table 4. Appendix A contains the detailed acquisition cost data.

Table 4. Ship Acquisition Cost Summary

(Millions of FY 80 Dollars)

	Total Acquisition Cost	Imputed Annual Cost
AO	100.65	3.355
TAO	75.66	2.522
Escort	67.37	2.244

4.3. Ship Operating and Support Cost

The Operating and Support (O&S) Cost for Navy oilers and escort ships were derived from the VAMOSC-SHIPS reporting system. The O&S cost for each ship for fiscal years 77, 78 and 79 were inflated to FY 80 dollars and averaged to obtain the O&S values used in this study. Oilers operated by the Military Sealift Command (MSC) are not included in the O&S costs reported by the VAMOSC-SHIPS system. Therefore, the average TAO O&S cost was estimated by assuming that the ratio of the TAO crew cost to AO crew cost is equal to the ratio of their O&S costs. The costs for Navy and MSC oiler crews are obtained from an OPNAV study on Fleet Support ships. This is the same technique which has been used in previous fuel studies. Table 5 presents a summary of O&S costs, Appendix B gives detailed O&S data for Navy Ships.

Table 5. Operating and Support Cost Summary
(Millions of FY 80 Dollars)

AO	14.637
TAO	20.586
Escort	18.727

4.4. Delivery Cost Allocations

The allocation of oiler costs to ship propulsion fuel delivery is based upon the percent of the oilers total POL deliveries which are DFM. The DFM percentage for AO's and TAO's was based upon data covering an eighteen month period. To obtain a per barrel delivery cost, the AO and TAO DFM delivery costs are simply divided by the average number of barrels each delivers annually. Table 6 presents the DFM percentage and the average DFM deliveries for AOs and TAOs.

Table 6. Oiler DFM Delivery Values

	DFM Per Cent	DFM Deliveries (K bbls)
AO	78	275.3
TAO	72	767.7

The cost of escort ships is allocated to ship propulsion fuel delivery by developing an escort ship cost per oiler. Past task force studies have shown that escorts and replenishment ships are assigned to the task force in a ratio of approximately six to four. Based upon this fact alone the number of escorts per oiler would be 1.5. However, escort ships are not solely dedicated to oiler support nor are the oilers constantly in the company of the escort ships. Therefore, it was assumed, as in past studies, that the escort ships accompany the oilers half of the time. The resulting number of escorts per oiler is, then, .75.

4.5. Current Delivery Cost

The cost of delivering fuel to ships at sea is derived using a weighted average technique. The average annual acquisition cost and average O&S cost for AOs, TAOs and escort ships have been presented in Tables 4 and 5 respectively. The average annual AO acquisition cost is added to the average annual AO O&S cost and the sum is multiplied by the DFM percentage for AOs. This value is multiplied by the number of AOs to yield the total delivery cost for AOs. This same procedure is used to calculate the TAO total delivery cost using TAO values. For escort ships the sum of the average annual acquisition cost and average annual O&S cost is multiplied by a composite DFM percentage and the number of escorts per oiler. This yields escort costs on a per oiler basis. Therefore, this value is multiplied by the total number of AOs and TAOs, resulting in the total delivery cost for escort ships. Adding the delivery costs for AOs, TAOs and escort ships, yields the total cost of delivering DFM by escorted UNREP oiler.

To calculate a total fuel delivery cost on a per barrel basis, the total barrels delivered is required. This value was derived by adding the total barrels of fuel delivered by Navy and MSC oilers. The total amount of fuel delivered by an AO was calculated by multiplying the average amount of fuel delivered by an AO times the number of AOs. The amount of fuel delivered by a TAO was calculated in the same manner. Adding the total barrels of fuel delivered by AO and TAO yields the total barrels of DFM delivered by UNREP oiler. Dividing the total delivery cost by total fuel delivered, yields the delivery cost per barrel of fuel delivered by escorted UNREP oiler of $36.02.

When ships receive fuel directly from fuel terminals, no delivery costs are incurred. This fact must be accounted for to develop a normalized fuel delivery cost. Based upon previous studies, it is assumed that ships received 70% of their fuel from an UNREP oiler and 30% from a fuel terminal. This 70/30 split is intended to be a representative value for all Navy ships. Some ships may receive all their fuel from oilers while other ships may receive all their fuel from a terminal. Therefore, using the total fuel cost value presented in this report for a particular ship type, should be done with caution. The normalized current fuel delivery cost is weighted 70% UNREP and 30% In-Port. Since the In-Port delivery cost is zero, the normalized current fuel delivery cost is simply 70% of the UNREP delivery cost. The resulting normalized current fuel delivery cost is, then, $25.21 per barrel.

4.6. Current Fuel Cost Summary

Thus far, the cost of purchasing, storing, handling, and delivering fuel has been presented. Table 7 summarizes these costs and presents the total cost of ship propulsion fuel.

Table 7. Current Fuel Cost Summary

Purchase	$54.18/bbl
Storage and handling	1.47
Delivery	25.21
	$80.86/bbl

4.7. Future Delivery Cost

Since current oilers and escort ships will have to be replaced, it is appropriate to consider the impact these replacements may have on fuel delivery costs. The AO 177 and the FFG 7 respectively represent the future oiler and escort ship. The essential elements in calculating delivery cost are the annual acquisition cost, annual O&S cost, DFM percentage of total POL and the annual DFM delivery amount. The fact that the future ships do not have procurement and O&S histories compariable with the current delivery ships, necessitates the use of representative data as opposed to historical averages. The average acquisition costs for these two future ships are based upon previous fuel study work and other sources of ship costs. The costs are put on an annual basis by assuming a 30 year economic life. The annual O&S costs were derived from the November 1980 Navy Program Factors Manual. The DFM percentage of total POL deliveries and the DFM delivery quantities are taken from previous fuel study analysis. Table 8 summarizes the data values for these future fuel delivery ships.

Table 8. Future Ships Fuel Delivery Cost Parameters

	Annual Acquisition Cost	Annual O&S Cost	DFM % of POL	Annual DFM Deliveries
AO 177	$5.8M	$14.5M	60%	288K bbls
FFG 7	$7.5M	$ 8.3M	-	-

Based upon the values in Table 8, the future cost of delivering DFM to ships at sea by escorted UNREP oiler is $66.98 per barrel as compared to the current cost of $36.02/bbl. Multiplying by 70% to obtain the future normalized fuel delivery cost yields $46.89/bbl as compared to the current cost of $25.21/bbl. This takes into consideration the fact that 30% of ship propulsion fuel is received from fuel terminals and incurs no delivery cost.

4.8. Overall Fuel Cost Summary

The overall fuel cost in FY 80 dollars on a cost per barrel basis consists of the purchase price, storage and handling costs and the average of the current and future normalized delivery costs. Taking a straight average of the current and future normalized delivery costs of $25.21/bbl and $46.89/bbl respectively, implies a 50/50 mix of current and future fleet oilers and their associated ocean escorts. This 50/50 mix is the technique which was used in past fuel studies and is used in this study to maintain analytical consistency. Table 9 presents this overall fuel cost summary.

Table 9. Overall Fuel Cost Summary

Purchase	$ 54.18/bbl
Storage and handling	1.47
Delivery	$ 36.05
Total	$ 91.70

5. Sensitivity Analyses

This section presents the sensitivity of the total fuel cost to variations in value of major data elements.

5.1. Escalated Total Fuel Costs

The derivation of total fuel cost in the body of this report is performed exclusively in FY 80 dollars. To show the impact of inflation on these costs they have been escalated to then year dollars using the Feb 1981 indices from the Assistant Secretary of Defense. The following table presents these costs for 1980, the base year, through the year 2000.

Table 10. Escalated Total Fuel Cost

Year	Cost	Year	Cost
1980	$ 91.70	1990	$181.94
1981	109.09	1991	191.04
1982	118.58	1992	200.59
1983	127.24	1993	210.62
1984	135.13	1994	221.15
1985	142.56	1995	232.21
1986	149.69	1996	243.82
1987	157.17	1997	256.01
1988	165.03	1998	268.81
1989	173.28	1999	282.25
		2000	296.36

5.2. Fuel Delivery Quantity

The amount of fuel delivered by Navy and MSC oilers varies from year to year. The following table shows the sensitivity of total fuel cost to changes in fuel delivery quantities. In the calculation of these values the purchase price and storage and handling costs were held constant at their base values. Also, the current and future delivery costs were held constant allowing the cost per barrel of fuel to vary strictly as a function of delivery quantity.

Table 11. Fuel Delivery Quantity Sensitivity

% Change From Base	Average Annual Delivery Quantity Per Oiler	Delivery Cost	Total Fuel Cost
- 20	361 K bbls	$ 45.12/bbl	$100.77/bbl
- 10	406	40.08	95.73
0	451	36.05	91.70
+ 10	496	32.76	88.41

5.3. UNREP Delivery Percentage

The amount of fuel which is received by Navy ships from fleet oilers expressed as a percent of total fuel received by the ship, is a difficult value to obtain. This is due to the structure of the fuel reporting systems which summarize total fuel for the oiler or the ship. Also, the value is subject to changes in fleet operating policies which are in turn subject to changes in world events. The 70/30 UNREP/In-Port delivery split may also vary by ship type. Therefore, total fuel cost has been sensitized to changes in the percent of fuel delivered by UNREP oiler in the following table.

Table 12. UNREP Delivery Percentage Sensitivity

UNREP %	Delivery Cost	Total Fuel Cost
50	$25.75/bbl	$ 81.40/bbl
60	30.90	86.55
70 (base)	36.05	91.70
80	41.20	96.85
90	46.35	102.00

5.4. Escorts per Oiler

In the basic determination of fuel cost it was assumed that there were .75 escort ships per oiler. Due to the subjectivity of this value, delivery cost and total fuel cost have been sensitized to the number of escorts per oiler in the following table.

Table 13. Escorts per Oiler Sensitivity

Escorts Per Oiler	Total Delivery Cost	Total Fuel Cost
.5	$31.98/bbl	$87.63/bbl
.6	33.61	89.26
.7	35.24	90.89
.75 (base)	36.05	91.70
.8	36.87	92.52
.9	38.50	94.15
1.0	40.13	95.78

5.5. Current/Future Ship Mix

In calculating the total overall cost of fuel, a 50/50 mix of current and future ships was used. The actual ratio of current to future ships would change incrementally as new ships are added to and old ships are removed from the fleet. The impact of various other ratios on the total overall delivery cost and total overall fuel cost are shown in the sensitivity analysis of this data element.

Table 14. Current/Future Ship Mix Sensitivity

Percent Current Ships	Percent Future Ships	Total Delivery Cost	Total Fuel Cost
100	0	$25.21/bbl	$ 80.86/bbl
75	25	30.63	86.28
50	50	36.05	91.70
25	75	41.47	97.12
0	100	46.89	102.54

Appendix A

Ship Acquisition Cost Data

*** SHIPS ACQUISITION COST ***
(THOUSANDS OF DOLLARS)

UIC	NAME	TYPE	CLASS	HULL	TOTAL COST FY81$	COST FY80$	IMPUTED ANNUAL
		AO	****	****	109583	100649	3354
		AO	22	****	130957	120281	4009
04951	ASHTABULA	AO	22	51	130957	120281	4009
		AO	51	****	119727	109967	3665
04848	CALOOSAHAT	AO	51	98	119678	109922	3664
04849	CANTSTEO	AO	51	99	119777	110012	3667
		AO	143	****	88752	81517	2717
05907	TRUCKEE	AO	143	147	88752	81517	2717
05908	PONCHATOUL	AO	143	148	88752	81517	2717
		AOE	****	****	224300	206015	6867
		AOE	1	****	224300	206015	6867
05832	SACRAMENTO	AOE	1	1	218853	201012	6700
05833	CAMDEN	AOE	1	2	193460	177689	5923
05848	SEATTLE	AOE	1	3	245001	225029	7501
20120	DETROIT	AOE	1	4	239889	220333	7344
		AOR	****	****	113606	104345	3478
		AOR	1	****	113606	104345	3478
05849	WICHITA	AOR	1	1	124584	114428	3814
05850	MILWAUKEE	AOR	1	2	113165	103940	3465
20122	KANSAS CIT	AOR	1	3	100521	92327	3078
20123	SAVANNAH	AOR	1	4	94321	86632	2888
20124	WABASH	AOR	1	5	102672	94302	3143
20125	KALAMAZOO	AOR	1	6	104419	95906	3197
20248	ROANOKE	AOR	1	7	155562	142881	4763
		FF	****	****	71382	65563	2185
		FF	1037	****	54028	49623	1654
54035	BRONSTEIN	FF	1037	1037	58669	53886	1796

*** SHIPS ACQUISITION COST ***
(THOUSANDS OF DOLLARS)

UIC	NAME	TYPE	CLASS	HULL	TOTAL COST FY81$	COST FY80$	IMPUTED ANNUAL
54036	MC CLOY	FF	1037	1038	49387	45361	1512
		FF	1040	****	72443	66538	2218
54037	GARCIA	FF	1040	1040	81151	74535	2485
54038	BRADLEY	FF	1040	1041	67140	61666	2056
54039	MC DONNELL	FF	1040	1043	68272	62706	2090
54040	BRUMBY	FF	1040	1044	58978	54170	1806
54041	DAVIDSON	FF	1040	1045	63757	58560	1952
54042	VOGE	FF	1040	1047	139825	128426	4281
54043	SAMPLE	FF	1040	1048	61575	56555	1885
54044	KOELSCH	FF	1040	1049	68215	62654	2088
54045	DAVID, ALB	FF	1040	1050	60387	55465	1849
54046	O CALLAHAN	FF	1040	1051	55138	50643	1688
		FF	1052	****	71906	66044	2201
54047	KNOX	FF	1052	1052	174803	160553	5352
54048	ROARK	FF	1052	1053	77953	71598	2387
54049	GRAY	FF	1052	1054	75648	69481	2316
54050	HEPBURN	FF	1052	1055	78718	72301	2410
54051	CONNOLE	FF	1052	1056	70125	64409	2147
54052	RATHBURNE	FF	1052	1057	67891	62356	2079
54053	MEYERKORD	FF	1052	1058	74086	68046	2268
54054	STMS, W S	FF	1052	1059	68096	62545	2085
54055	LANG	FF	1052	1060	73151	67188	2240
54056	PATTERSON	FF	1052	1061	69297	63648	2122
54057	WHIPPLE	FF	1052	1062	110692	101668	3389
54058	REASONER	FF	1052	1063	67400	61906	2064
54059	LOCKWOOD	FF	1052	1064	78142	71772	2392
54060	STETN	FF	1052	1065	70606	64850	2162
54061	SHEILDS, M	FF	1052	1066	79790	73285	2443
54062	HAMMOND, E	FF	1052	1067	71375	65557	2185
54063	VREELAND	FF	1052	1068	70317	64585	2153
54064	BAGLEY	FF	1052	1069	67631	62117	2071
54065	DOWNES	FF	1052	1070	76884	70616	2354
54066	BADGER	FF	1052	1071	73991	67959	2265
54067	BLAKELY	FF	1052	1072	66323	60916	2031
54068	PEARY, ROB	FF	1052	1073	77042	70761	2359
54069	HOLT, HARO	FF	1052	1074	76958	70684	2356
54070	TRIPPE	FF	1052	1075	64916	59624	1987
54071	FANNING	FF	1052	1076	74023	67988	2266
54072	OVELLET	FF	1052	1077	68241	62678	2089
20049	HEWES, JOS	FF	1052	1078	74859	68757	2292
20050	BOWEN	FF	1052	1079	62193	57123	1904
20051	PAUL	FF	1052	1080	62005	56950	1898
20052	AYLWIN	FF	1052	1081	62345	57263	1909

*** SHIPS ACQUISITION COST ***
(THOUSANDS OF DOLLARS)

UIC	NAME	TYPE	CLASS	HULL	TOTAL COST FY81$	COST FY80$	IMPUTED ANNUAL
20053	MONTGOMERY	FF	1052	1082	62088	57027	1901
20054	COOK	FF	1052	1083	64615	59348	1978
20055	MC CANDLES	FF	1052	1084	65628	60278	2009
20056	BEARY, DON	FF	1052	1085	63282	58123	1937
20057	BREWTON	FF	1052	1086	63616	58430	1948
20058	KIRK	FF	1052	1087	69324	63673	2122
20066	BARBEY	FF	1052	1088	65892	60521	2017
20067	BROWN, JES	FF	1052	1089	65892	60521	2017
20068	AINSWORTH	FF	1052	1090	65892	60521	2017
20069	MILLER	FF	1052	1091	62733	57619	1921
20070	HART, THOM	FF	1052	1092	62733	57619	1921
20071	CAPODANNO	FF	1052	1093	62733	57619	1921
20072	PHARRIS	FF	1052	1094	62733	57619	1921
20073	TRUETT	FF	1052	1095	62733	57619	1921
20074	VALDEZ	FF	1052	1096	62733	57619	1921
20075	MCINERNEY	FF	1052	1097	59570	54714	1824
		FFG	****	****	91682	84208	2807
		FFG	1	****	91682	84208	2807
04692	BROOKE	FFG	1	1	113543	104287	3476
04693	RAMSEY	FFG	1	2	97999	90010	3000
04694	SCHOFIELD	FFG	1	3	92655	85102	2837
04695	TALBOT	FFG	1	4	92728	85169	2839
04698	PAGE, RICH	FFG	1	5	77268	70970	2366
04699	FURER, JUL	FFG	1	6	75899	69712	2324
		TAO	****	****	82376	75661	2522
		TAO	22	****	38887	35716	1190
04957	MARTAS	TAO	22	57	39290	36087	1203
04962	TALLUGA	TAO	22	62	38484	35346	1178
		TAO	105	****	87889	80724	2690
04805	MISPILLION	TAO	105	105	106595	97905	3263
04806	NAVASOTA	TAO	105	106	76069	69867	2329
04807	PASSUMPSIC	TAO	105	107	91709	84233	2808
04808	PAWCATUCK	TAO	105	108	86466	79417	2647
04809	WACCAMAW	TAO	105	109	78607	72199	2407
		TAO	143	****	97231	89305	2976
05903	NEOSHO	TAO	143	143	118303	108659	3622
05904	MISSISSINE	TAO	143	144	93119	85528	2851

*** SHIPS ACQUISITION COST ***
(THOUSANDS OF DOLLARS)

UIC	NAME	TYPE	CLASS	HULL	TOTAL COST FY81$	COST FY80$	IMPUTED ANNUAL
05905	HASSAYAMPA	TAO	143	145	88752	81517	2717
05906	KAWTSHIWI	TAO	143	146	88752	81517	2717

Appendix B

Ship Operating and Support Cost Data

*** VAMOSC-SHIPS O&S DATA ***

SHIP TYPE, CLASS AND HULL AVERAGES PLUS INDIVIDUAL SHIP O&S COSTS
FOR FY77-FY78-FY79 BY FIRST LEVEL COST ELEMENTS IN THOUSANDS OF FY80 DOLLARS

TYPE	CLASS	HULL	SHIP-YEARS	# OFF	# ENL	1.DIRECT COSTS	2.INTER MAINT	3.DEPOT MAINT	4.REC INVEST	5.INDIR COSTS	TOTAL O&S
AO	****	****	15	18	301	5530	193	8627	83	200	14637
AO	22	****	3	18	327	5371	213	8877	139	193	14797
AO	22	51	3	18	327	5371	213	8877	139	193	14797
AO	22	51	FY77	19	324	5813	65	23372	7	269	29528
AO	22	51	FY78	18	328	4880	227	1242	381	166	6898
AO	22	51	FY79	19	331	5421	349	2018	29	145	7965
AO	51	****	6	20	307	5784	153	3713	66	253	9973
AO	51	98	3	20	308	5840	95	5080	51	202	11272
AO	51	98	FY77	20	292	6356	141	1394	83	285	8261
AO	51	98	FY78	19	313	6674	89	300	67	168	7300
AO	51	98	FY79	21	321	4492	57	13547	5	154	18257
AO	51	99	3	21	305	5727	212	2345	81	305	8673
AO	51	99	FY77	20	311	6003	164	816	82	255	7321
AO	51	99	FY78	22	296	5818	293	217	135	128	6593
AO	51	99	FY79	21	310	5362	179	6004	26	533	12106
AO	143	****	6	16	283	5355	222	13416	72	151	19221
AO	143	147	3	16	272	5395	296	213	26	156	6090
AO	143	147	FY77	15	273	5895	152	176	29	223	6477
AO	143	147	FY78	17	271	5132	499	201	15	124	5973
AO	143	147	FY79	17	272	5158	239	264	36	123	5821
AO	143	148	3	15	295	5316	148	26619	118	146	32351
AO	143	148	FY77	16	290	5762	158	61834	7	241	68004
AO	143	148	FY78	16	295	4957	131	16821	324	114	22350
AO	143	148	FY79	15	302	5231	157	1202	25	84	6701
AOE	****	****	12	23	521	9350	155	5876	92	575	16051
AOE	1	****	12	23	521	9350	155	5876	92	575	16051
AOE	1	1	3	25	549	9422	39	12897	85	289	22736
AOE	1	1	FY77	25	542	9466	32	36378	7	455	46339
AOE	1	1	FY78	26	560	10079	40	1027	144	226	11518
AOE	1	1	FY79	26	547	8723	47	1288	105	186	10351

*** VAMOSC-SHIPS O&S DATA ***

SHIP TYPE, CLASS AND HULL AVERAGES PLUS INDIVIDUAL SHIP O&S COSTS

FOR FY77-FY78-FY79 BY FIRST LEVEL COST ELEMENTS IN THOUSANDS OF FY80 DOLLARS

SHIP TYPE	CLASS	HULL	SHIP-YEARS	# OFF	# ENL	1.DIRECT COSTS	2.INTER MAINT	3.DEPOT MAINT	4.REC INVEST	5.INDTR COSTS	TOTAL O&S
ADE	1	2	3	23	524	9393	42	836	142	442	10787
ADE	1	2	FY77	22	523	8456	3	0	0	407	8867
ADE	1	2	FY78	24	531	8775	87	2079	245	195	11382
ADE	1	2	FY79	23	518	10738	36	431	183	725	12114
ADE	1	3	3	23	508	9794	373	3004	93	777	14042
ADE	1	3	FY77	23	515	10285	411	2380	125	442	13645
ADE	1	3	FY78	23	507	9136	542	576	140	225	10620
ADE	1	3	FY79	24	502	9961	166	6056	14	1664	17863
ADE	1	4	3	22	504	8861	165	6766	50	795	16640
ADE	1	4	FY77	21	511	7658	21	19267	19	430	27397
ADE	1	4	FY78	24	503	10258	367	453	16	190	11286
ADE	1	4	FY79	23	499	8667	109	580	117	1765	11239
ADR	****	****	20	19	388	6854	125	2912	232	246	10373
ADR	1	****	20	19	388	6854	125	2912	232	246	10373
ADR	1	1	3	18	402	6587	129	6438	406	219	13782
ADR	1	1	FY77	18	396	7956	92	228	10	299	8586
ADR	1	1	FY78	19	402	6383	101	558	46	171	7262
ADR	1	1	FY79	19	408	5424	194	18528	1162	188	25498
ADR	1	2	3	18	377	7518	163	202	158	265	8310
ADR	1	2	FY77	19	371	7934	111	14	230	292	8582
ADR	1	2	FY78	20	375	6807	207	186	137	193	7532
ADR	1	2	FY79	17	386	7815	171	408	109	312	8816
ADR	1	3	3	19	389	7192	81	745	212	216	8448
ADR	1	3	FY77	20	369	7797	132	79	41	273	8322
ADR	1	3	FY78	20	398	6116	87	123	251	203	6782
ADR	1	3	FY79	19	400	7664	25	2033	344	174	10242
ADR	1	4	3	18	370	6687	146	5683	70	255	12844
ADR	1	4	FY77	18	371	5918	33	16390	6	374	22723
ADR	1	4	FY78	18	368	7331	232	32	125	142	7864
ADR	1	4	FY79	19	372	6814	175	627	80	250	7947

*** VAMOSC-SHIPS O&S DATA ***

SHIP TYPE, CLASS AND HULL AVERAGES PLUS INDIVIDUAL SHIP O&S COSTS

FOR FY77-FY78-FY79 BY FIRST LEVEL COST ELEMENTS IN THOUSANDS OF FY80 DOLLARS

SHIP TYPE	CLASS	HULL	SHIP-YEARS	# OPF	# ENL	1.DIRECT COSTS	2.INTER MAINT	3.DEPOT MAINT	4.REC INVEST	5.INDIR COSTS	TOTAL O&S
AOR	1	5	3	20	391	6329	105	1588	265	270	8560
AOR	1	5	FY77	20	378	6963	155	133	6	303	7562
AOR	1	5	FY78	20	394	5302	51	83	411	201	6050
AOR	1	5	FY79	21	402	6724	109	4548	379	308	12070
AOR	1	6	3	19	399	6964	172	4544	320	236	12239
AOR	1	6	FY77	18	383	8477	141	1060	23	361	10063
AOR	1	6	FY78	20	411	7074	208	329	169	169	7951
AOR	1	6	FY79	20	404	5342	167	12245	768	178	18703
AOR	1	7	2	18	390	6626	62	322	178	265	7456
AOR	1	7	FY77	0	0	0	0	0	0	0	0
AOR	1	7	FY78	20	389	6985	46	76	251	172	7532
AOR	1	7	FY79	17	392	6268	78	569	106	358	7381
FF	****	****	174	17	238	4598	122	4053	440	163	9380
FF	1037	****	6	13	193	3736	121	1659	557	132	6208
FF	1037	1037	3	13	199	3705	108	2209	1019	136	7181
FF	1037	1037	FY77	13	195	3630	65	6258	47	165	10167
FF	1037	1037	FY78	14	196	3836	94	204	406	112	4655
FF	1037	1037	FY79	13	207	3650	165	167	2605	133	6723
FF	1037	1038	3	13	188	3767	134	1108	94	128	5235
FF	1037	1038	FY77	14	185	4076	171	37	180	146	4612
FF	1037	1038	FY78	14	197	3819	112	67	58	110	4167
FF	1037	1038	FY79	13	182	3407	120	3222	46	129	6926
FF	1040	****	30	18	240	4467	124	3804	207	162	8768
FF	1040	1040	3	17	240	4156	101	887	182	188	5517
FF	1040	1040	FY77	18	230	4579	116	199	89	193	5179
FF	1040	1040	FY78	18	240	3089	68	201	459	165	3983
FF	1040	1040	FY79	17	251	4801	120	2262	0	207	7391
FF	1040	1041	3	17	239	5227	116	5700	42	148	11236
FF	1040	1041	FY77	17	235	5776	47	87	0	199	6111
FF	1040	1041	FY78	19	237	4681	217	705	59	113	5777
FF	1040	1041	FY79	16	245	5226	84	16309	68	134	21822

*** VAMOSC-SHIPS O&S DATA ***

SHIP TYPE, CLASS AND HULL AVERAGES PLUS INDIVIDUAL SHIP O&S COSTS
FOR FY77-FY78-FY79 BY FIRST LEVEL COST ELEMENTS IN THOUSANDS OF FY80 DOLLARS

TYPE	CLASS	HULL	SHIP-YEARS	# OFF	# ENL	1.DIRECT COSTS	2.INTER MAINT	3.DEPOT MAINT	4.REC INVEST	5.INDIR COSTS	TOTAL O&S
FF	1040	1043	3	17	238	4457	98	15	119	161	4854
FF	1040	1043	FY77	17	215	4347	85	19	76	193	4722
FF	1040	1043	FY78	18	251	3848	33	1	233	144	4261
FF	1040	1043	FY79	18	249	5177	177	25	50	148	5579
FF	1040	1044	3	17	229	4053	74	198	79	143	4552
FF	1040	1044	FY77	18	221	3774	56	10	6	184	4031
FF	1040	1044	FY78	17	237	3661	44	102	46	112	3968
FF	1040	1044	FY79	18	229	4726	123	483	187	134	5657
FF	1040	1045	3	18	244	4367	214	7299	67	149	12099
FF	1040	1045	FY77	19	238	4289	170	20460	8	185	25115
FF	1040	1045	FY78	19	243	4202	140	1388	136	149	6017
FF	1040	1045	FY79	18	251	4610	334	49	58	115	5167
FF	1040	1047	3	18	235	4321	103	4730	289	148	9594
FF	1040	1047	FY77	19	236	4986	116	565	114	194	5977
FF	1040	1047	FY78	18	235	4701	150	3	71	95	5023
FF	1040	1047	FY79	18	236	3276	43	13622	683	155	17782
FF	1040	1048	3	19	262	4617	126	4323	381	166	9616
FF	1040	1048	FY77	18	259	4717	110	3869	16	216	8930
FF	1040	1048	FY78	20	268	5034	119	9015	138	132	14441
FF	1040	1048	FY79	19	261	4101	151	85	990	150	5479
FF	1040	1049	3	19	236	4499	137	3586	419	169	8812
FF	1040	1049	FY77	19	237	5647	278	473	215	191	6804
FF	1040	1049	FY78	21	239	4342	120	38	89	129	4720
FF	1040	1049	FY79	19	232	3508	13	10248	955	187	14912
FF	1040	1050	3	18	249	4708	119	5494	21	199	10543
FF	1040	1050	FY77	19	244	4698	44	16258	0	207	21209
FF	1040	1050	FY78	19	251	4820	140	9	28	181	5180
FF	1040	1050	FY79	17	254	4606	173	216	35	211	5242
FF	1040	1051	3	17	228	4269	153	5809	471	151	10856
FF	1040	1051	FY77	17	219	4065	28	16969	16	185	21265
FF	1040	1051	FY78	18	227	4731	158	0	1289	118	6297
FF	1040	1051	FY79	18	238	4011	275	459	110	150	5007

*** VAMOSC-SHIPS O&S DATA ***

SHIP TYPE, CLASS AND HULL AVERAGES PLUS INDIVIDUAL SHIP O&S COSTS

FOR FY77-FY78-FY79 BY FIRST LEVEL COST ELEMENTS IN THOUSANDS OF FY80 DOLLARS

TYPE	CLASS	HULL	SHIP-YEARS	# OFF	# ENL	1.DIRECT COSTS	2.INTER MAINT	3.DEPOT MAINT	4.REC INVEST	5.INDTR COSTS	TOTAL O&S
FF	1052	****	138	16	239	4664	121	4211	486	164	9651
FF	1052	1052	3	17	229	4971	98	7831	3028	143	16075
FF	1052	1052	FY77	17	214	4812	49	22079	51	176	27170
FF	1052	1052	FY78	18	235	4872	116	497	8917	112	14517
FF	1052	1052	FY79	17	238	5231	130	917	117	142	6539
FF	1052	1053	3	17	245	5288	198	887	106	155	6637
FF	1052	1053	FY77	17	241	5888	138	241	53	196	6517
FF	1052	1053	FY78	17	251	5062	210	0	125	131	5530
FF	1052	1053	FY79	17	243	4916	247	2421	141	138	7865
FF	1052	1054	3	16	244	4605	106	10936	334	167	16151
FF	1052	1054	FY77	17	239	4831	194	3765	48	205	9045
FF	1052	1054	FY78	17	241	5387	95	0	76	100	5660
FF	1052	1054	FY79	15	254	3598	29	29043	880	198	33750
FF	1052	1055	3	16	247	3983	169	1444	527	168	6293
FF	1052	1055	FY77	16	247	4449	142	212	46	205	5056
FF	1052	1055	FY78	17	249	3130	64	0	32	154	3381
FF	1052	1055	FY79	16	246	4370	302	4121	1503	145	10444
FF	1052	1056	3	18	242	4689	148	4166	567	196	9769
FF	1052	1056	FY77	18	243	5624	101	0	197	212	6135
FF	1052	1056	FY78	18	248	4615	281	35	101	193	5228
FF	1052	1056	FY79	18	236	3830	62	12465	1404	184	17946
FF	1052	1057	3	17	250	4908	92	6341	89	144	11577
FF	1052	1057	FY77	17	245	5638	52	193	43	192	6120
FF	1052	1057	FY78	18	252	3722	100	18651	119	134	22728
FF	1052	1057	FY79	16	253	5366	126	181	105	106	5885
FF	1052	1058	3	16	243	4362	77	2279	487	162	7370
FF	1052	1058	FY77	16	236	5570	94	37	1	176	5880
FF	1052	1058	FY78	17	250	3757	77	15	1	159	4011
FF	1052	1058	FY79	17	244	3761	61	6786	1459	152	12220

*** VAMOSC-SHIPS O&S DATA ***

SHIP TYPE, CLASS AND HULL AVERAGES PLUS INDIVIDUAL SHIP O&S COSTS

FOR FY77-FY78-FY79 BY FIRST LEVEL COST ELEMENTS IN THOUSANDS OF FY80 DOLLARS

TYPE	CLASS	HULL	SHIP-YEARS	# OPR	# ENL	1.DIRECT COSTS	2.INTER MAINT	3.DEPOT MAINT	4.REC INVEST	5.INDIR COSTS	TOTAL O&S
FF	1052	1059	3	16	229	5010	126	6167	129	167	11602
FF	1052	1059	FY77	15	218	5319	167	717	176	199	6581
FF	1052	1059	FY78	17	231	5335	159	2	154	152	5803
FF	1052	1059	FY79	17	239	4378	52	17782	59	150	22422
FF	1052	1060	3	16	247	4391	117	106	418	160	5196
FF	1052	1060	FY77	17	247	4810	144	91	46	189	5281
FF	1052	1060	FY78	17	242	3480	10	0	1080	144	4717
FF	1052	1060	FY79	16	252	4884	198	227	130	149	5590
FF	1052	1061	3	16	233	4375	157	8949	317	148	13948
FF	1052	1061	FY77	16	224	3676	28	24277	28	212	28223
FF	1052	1061	FY78	17	229	5039	195	658	161	111	6165
FF	1052	1061	FY79	17	246	4411	250	1912	762	122	7458
FF	1052	1062	3	18	252	5138	129	1759	66	152	7247
FF	1052	1062	FY77	18	249	5776	71	2314	53	192	8408
FF	1052	1062	FY78	18	254	5344	150	1520	111	136	7263
FF	1052	1062	FY79	18	255	4294	168	1444	35	129	6072
FF	1052	1063	3	16	242	4604	198	5482	91	168	10546
FF	1052	1063	FY77	16	243	4919	74	15100	14	185	20294
FF	1052	1063	FY78	17	242	4862	204	5	161	124	5358
FF	1052	1063	FY79	17	243	4031	318	1341	100	195	5987
FF	1052	1064	3	17	240	4979	76	88	119	162	5428
FF	1052	1064	FY77	17	249	5417	39	0	44	215	5717
FF	1052	1064	FY78	17	244	4838	131	4	152	118	5245
FF	1052	1064	FY79	17	229	4683	60	261	163	155	5323
FF	1052	1065	3	17	238	4740	149	3847	641	138	9519
FF	1052	1065	FY77	18	230	4884	143	10603	56	170	15858
FF	1052	1065	FY78	19	242	4674	124	10	266	108	5185
FF	1052	1065	FY79	16	244	4662	182	929	1603	137	7514
FF	1052	1066	3	17	243	4284	112	5464	726	186	10776
FF	1052	1066	FY77	18	249	5186	215	1106	83	224	6816
FF	1052	1066	FY78	18	247	3970	101	3	337	130	4543
FF	1052	1066	FY79	16	234	3697	20	15284	1760	205	20969

*** VAMOSC-SHIPS O&S DATA ***

SHIP TYPE, CLASS AND HULL AVERAGES PLUS INDIVIDUAL SHIP O&S COSTS

FOR FY77-FY78-FY79 BY FIRST LEVEL COST ELEMENTS IN THOUSANDS OF FY80 DOLLARS

TYPE	CLASS	HULL	SHIP-YEARS	# OFF	# ENL	1.DIRECT COSTS	2.INTER MAINT	3.DEPOT MAINT	4.REC INVEST	5.INDTR COSTS	TOTAL O&S
FF	1052	1067	3	15	247	5137	91	438	547	146	6362
FF	1052	1067	FY77	15	248	5554	75	0	73	197	5901
FF	1052	1067	FY78	17	254	6121	57	0	93	122	6394
FF	1052	1067	FY79	15	239	3736	143	1315	1477	119	6792
FF	1052	1068	3	16	239	4858	203	131	138	159	5491
FF	1052	1068	FY77	17	235	4953	129	85	110	188	5467
FF	1052	1068	FY78	17	235	4905	247	2	156	163	5476
FF	1052	1068	FY79	16	248	4716	233	306	148	128	5532
FF	1052	1069	3	16	242	4538	111	7269	941	146	13009
FF	1052	1069	FY77	16	233	5686	196	457	35	183	6559
FF	1052	1069	FY78	16	246	3683	75	14827	49	108	18743
FF	1052	1069	FY79	17	248	4246	64	6524	2741	149	13726
FF	1052	1070	3	16	249	4556	115	603	752	169	6199
FF	1052	1070	FY77	16	240	3956	57	0	8	192	4215
FF	1052	1070	FY78	17	260	4234	125	1023	1296	142	6822
FF	1052	1070	FY79	16	247	5479	165	788	952	175	7561
FF	1052	1071	3	16	251	5261	127	7078	160	154	12783
FF	1052	1071	FY77	17	235	5080	20	20641	132	217	26092
FF	1052	1071	FY78	17	259	5420	166	193	154	116	6050
FF	1052	1071	FY79	15	259	5283	197	402	194	130	6207
FF	1052	1072	3	18	229	4846	113	894	143	170	6169
FF	1052	1072	FY77	18	230	5319	103	56	244	187	5911
FF	1052	1072	FY78	18	235	5181	173	74	134	171	5734
FF	1052	1072	FY79	18	223	4040	65	2552	52	152	6863
FF	1052	1073	3	17	254	4742	112	2179	222	141	7400
FF	1052	1073	FY77	18	242	4769	83	0	37	202	5092
FF	1052	1073	FY78	18	257	4510	126	6328	497	110	11573
FF	1052	1073	FY79	16	263	4947	128	211	134	112	5535
FF	1052	1074	3	16	247	4443	157	8565	408	163	13740
FF	1052	1074	FY77	17	236	3931	38	23975	5	203	28155
FF	1052	1074	FY78	16	251	4968	158	1577	445	138	7288
FF	1052	1074	FY79	16	255	4431	277	144	775	149	5778

*** VAMOSC-SHIPS O&S DATA ***

SHIP TYPE, CLASS AND HULL AVERAGES PLUS INDIVIDUAL SHIP O&S COSTS

FOR FY77-FY78-FY79 BY FIRST LEVEL COST ELEMENTS IN THOUSANDS OF FY80 DOLLARS

TYPE	CLASS	HULL	SHIP-YEARS	# OFF	# ENL	1.DIRECT COSTS	2.INTER MAINT	3.DEPOT MAINT	4.REC INVEST	5.INDIR COSTS	TOTAL O&S
FF	1052	1075	3	18	235	5341	107	200	213	164	6029
FF	1052	1075	FY77	18	228	5140	73	67	274	193	5749
FF	1052	1075	FY78	18	237	5405	134	68	215	142	5965
FF	1052	1075	FY79	18	240	5480	116	466	151	159	6373
FF	1052	1076	3	17	243	4056	105	1138	515	162	5979
FF	1052	1076	FY77	16	229	4065	53	3	26	198	4348
FF	1052	1076	FY78	19	244	3319	79	1929	1356	138	6822
FF	1052	1076	FY79	17	258	4786	184	1483	163	152	6769
FF	1052	1077	3	17	247	4718	174	13793	529	150	19367
FF	1052	1077	FY77	18	237	5260	169	40518	24	191	46163
FF	1052	1077	FY78	18	249	5118	81	0	134	101	5435
FF	1052	1077	FY79	16	257	3778	273	863	1431	159	6505
FF	1052	1078	3	17	247	4902	107	6497	173	191	11874
FF	1052	1078	FY77	17	248	4544	33	18541	146	193	23459
FF	1052	1078	FY78	17	252	4248	217	423	159	185	5234
FF	1052	1078	FY79	18	242	5916	72	528	215	197	6929
FF	1052	1079	3	16	232	5330	132	6742	199	161	12568
FF	1052	1079	FY77	16	230	5204	53	19283	184	191	24918
FF	1052	1079	FY78	17	229	5300	150	16	220	128	5816
FF	1052	1079	FY79	16	239	5487	193	929	195	166	6971
FF	1052	1080	3	16	237	4746	123	961	1472	169	7475
FF	1052	1080	FY77	16	228	4174	49	0	98	174	4497
FF	1052	1080	FY78	17	238	5333	154	758	457	174	6879
FF	1052	1080	FY79	17	245	4733	168	2125	3861	161	11051
FF	1052	1081	3	16	238	4581	147	6855	179	180	11944
FF	1052	1081	FY77	16	231	4157	5	19465	142	196	23966
FF	1052	1081	FY78	16	235	4930	195	79	175	169	5550
FF	1052	1081	FY79	16	250	4656	242	1021	221	175	6317
FF	1052	1082	3	16	232	4628	115	72	185	181	5184
FF	1052	1082	FY77	16	224	4785	105	0	112	174	5177
FF	1052	1082	FY78	17	236	4043	67	208	337	180	4837
FF	1052	1082	FY79	17	236	5057	175	8	108	190	5540

*** VAMOSC-SHIPS O&S DATA ***

SHIP TYPE, CLASS AND HULL AVERAGES PLUS INDIVIDUAL SHIP O&S COSTS

FOR FY77-FY78-FY79 BY FIRST LEVEL COST ELEMENTS IN THOUSANDS OF FY80 DOLLARS

TYPE	CLASS	HULL	SHIP-YEARS	# OFF	# ENL	1.DIRECT COSTS	2.INTER MAINT	3.DEPOT MAINT	4.REC INVEST	5.INDIR COSTS	TOTAL O&S
FF	1052	1083	3	17	247	4192	120	2259	750	176	7501
FF	1052	1083	FY77	16	239	5124	203	42	98	201	5670
FF	1052	1083	FY78	18	250	3340	104	0	25	129	3599
FF	1052	1083	FY79	17	252	4113	53	6737	2128	200	13234
FF	1052	1084	3	16	230	4438	107	7175	140	177	12041
FF	1052	1084	FY77	16	226	5115	164	17	69	171	5538
FF	1052	1084	FY78	17	233	3450	41	20601	275	186	24556
FF	1052	1084	FY79	17	233	4750	117	909	76	176	6030
FF	1052	1085	3	18	233	4353	139	890	143	185	5714
FF	1052	1085	FY77	17	224	4476	180	0	46	188	4892
FF	1052	1085	FY78	18	240	3727	32	17	299	166	4243
FF	1052	1085	FY79	19	236	4857	206	2655	86	202	8009
FF	1052	1086	3	17	245	5006	154	6420	166	160	11909
FF	1052	1086	FY77	17	237	5598	69	42	44	194	5949
FF	1052	1086	FY78	18	248	3918	86	19049	311	179	23544
FF	1052	1086	FY79	17	250	5504	308	171	143	107	6235
FF	1052	1087	3	17	224	4073	71	429	626	155	5358
FF	1052	1087	FY77	17	222	4221	64	2	49	203	4542
FF	1052	1087	FY78	18	225	3263	111	0	1698	108	5181
FF	1052	1087	FY79	17	227	4735	39	1287	133	154	6351
FF	1052	1088	3	17	243	4380	98	6926	727	166	12299
FF	1052	1088	FY77	16	231	5521	147	6	10	180	5866
FF	1052	1088	FY78	18	251	3395	44	16677	28	159	20305
FF	1052	1088	FY79	18	248	4224	103	4095	2143	161	10727
FF	1052	1089	3	17	229	4366	45	1347	738	137	6637
FF	1052	1089	FY77	17	225	5369	58	66	99	164	5758
FF	1052	1089	FY78	18	228	3040	7	13	9	107	3178
FF	1052	1089	FY79	17	235	4691	72	3964	2107	140	10976
FF	1052	1090	3	16	231	4542	132	7236	649	170	12732
FF	1052	1090	FY77	17	226	5494	98	0	265	179	6038
FF	1052	1090	FY78	16	233	4111	262	12236	106	149	16866
FF	1052	1090	FY79	16	234	4021	38	9473	1576	182	15292

*** VAMOSC-SHIPS O&S DATA ***

SHIP TYPE, CLASS AND HULL AVERAGES PLUS INDIVIDUAL SHIP O&S COSTS

FOR FY77-FY78-FY79 BY FIRST LEVEL COST ELEMENTS IN THOUSANDS OF FY80 DOLLARS

TYPE	CLASS	HULL	SHIP-YEARS	# OFF	# ENL	1.DIRECT COSTS	2.INTER MAINT	3.DEPOT MAINT	4.REC INVEST	5.INDTR COSTS	TOTAL O&S
FF	1052	1091	3	17	239	4674	106	5089	724	182	10779
FF	1052	1091	FY77	18	238	5781	88	223	130	187	6411
FF	1052	1091	FY78	18	245	4329	162	11	65	184	4754
FF	1052	1091	FY79	17	235	3914	69	15034	1977	176	21172
FF	1052	1092	3	16	235	4387	105	7628	528	182	12834
FF	1052	1092	FY77	18	231	5038	128	158	75	187	5588
FF	1052	1092	FY78	16	237	4725	171	501	132	131	5663
FF	1052	1092	FY79	15	237	3400	18	22227	1377	229	27253
FF	1052	1093	3	15	228	4430	126	1712	773	152	7196
FF	1052	1093	FY77	16	225	5279	220	80	137	184	5902
FF	1052	1093	FY78	16	233	3745	39	0	37	125	3947
FF	1052	1093	FY79	14	226	4268	119	5058	2145	149	11741
FF	1052	1094	3	18	227	4485	83	4793	600	183	10147
FF	1052	1094	FY77	19	224	5179	143	0	178	180	5681
FF	1052	1094	FY78	18	228	4914	65	15	232	129	5357
FF	1052	1094	FY79	18	231	3362	43	14364	1392	241	19403
FF	1052	1095	3	16	239	4694	105	6690	623	179	12294
FF	1052	1095	FY77	17	224	5230	124	44	99	194	5694
FF	1052	1095	FY78	16	244	5579	153	1147	83	131	7095
FF	1052	1095	FY79	16	250	3273	39	18879	1689	213	24095
FF	1052	1096	3	16	234	4633	69	5054	601	176	10536
FF	1052	1096	FY77	17	234	5229	78	28	111	198	5645
FF	1052	1096	FY78	16	229	5238	105	79	107	140	5621
FF	1052	1096	FY79	17	241	3434	26	15106	1585	191	20344
FF	1052	1097	3	16	224	4901	138	921	147	170	6281
FF	1052	1097	FY77	16	221	5170	165	362	191	185	6075
FF	1052	1097	FY78	16	225	4857	135	70	128	149	5341
FF	1052	1097	FY79	16	227	4677	116	2333	123	178	7429
FFG	****	****	18	16	243	5304	128	2065	237	174	7912
FFG	1	****	18	16	243	5304	128	2065	237	174	7912
FFG	1	1	3	17	243	5390	145	927	146	154	6766
FFG	1	1	FY77	17	242	5893	126	847	61	202	7131
FFG	1	1	FY78	17	243	4998	159	1673	187	131	7150
FFG	1	1	FY79	17	244	5280	152	262	191	129	6017

*** VAMOSC-SHIPS O&S DATA ***

SHIP TYPE, CLASS AND HULL AVERAGES PLUS INDIVIDUAL SHIP O&S COSTS

FOR FY77-FY78-FY79 BY FIRST LEVEL COST ELEMENTS IN THOUSANDS OF FY80 DOLLARS

TYPE	CLASS	HULL	SHIP-YEARS	# OFF	# ENL	1.DIRECT COSTS	2.INTER MAINT	3.DEPOT MAINT	4.REC INVEST	5.INDIR COSTS	TOTAL O&S
FFG	1	2	3	16	247	4885	54	2955	617	170	8684
FFG	1	2	FY77	17	244	5293	42	2	69	192	5599
FFG	1	2	FY78	18	257	3863	37	8815	193	181	13092
FFG	1	2	FY79	15	241	5500	84	50	1590	137	7363
FFG	1	3	3	15	242	5191	145	6170	155	171	11835
FFG	1	3	FY77	16	232	5020	83	18327	21	197	23650
FFG	1	3	FY78	16	238	4995	169	10	222	132	5531
FFG	1	3	FY79	13	257	5558	183	175	223	184	6325
FFG	1	4	3	16	245	4779	133	683	149	182	5930
FFG	1	4	FY77	16	240	5003	216	0	152	188	5561
FFG	1	4	FY78	17	258	3839	51	1615	107	186	5801
FFG	1	4	FY79	15	239	5495	133	436	189	173	6429
FFG	1	5	3	17	242	5636	142	1152	158	177	7267
FFG	1	5	FY77	16	238	5601	74	0	170	196	6042
FFG	1	5	FY78	19	250	5244	216	760	162	142	6526
FFG	1	5	FY79	18	238	6063	137	2696	144	193	9234
FFG	1	6	3	17	238	5945	147	502	199	195	6991
FFG	1	6	FY77	18	233	6531	87	146	157	202	7125
FFG	1	6	FY78	17	243	5635	132	361	227	198	6555
FFG	1	6	FY79	16	240	5670	224	1000	213	185	7295
TAO	****	****	6	15	289	5637	142	4908	56	163	10908
TAO	22	****	0	0	0	0	0	0	0	0	0
TAO	22	57	0	0	0	0	0	0	0	0	0
TAO	22	57	FY77	0	0	0	0	0	0	0	0
TAO	22	57	FY78	0	0	0	0	0	0	0	0
TAO	22	57	FY79	0	0	0	0	0	0	0	0
TAO	22	62	0	0	0	0	0	0	0	0	0
TAO	22	62	FY77	0	0	0	0	0	0	0	0
TAO	22	62	FY78	0	0	0	0	0	0	0	0
TAO	22	62	FY79	0	0	0	0	0	0	0	0

*** VAMOSC-SHIPS O&S DATA ***

SHIP TYPE, CLASS AND HULL AVERAGES PLUS INDIVIDUAL SHIP O&S COSTS
FOR FY77-FY78-FY79 BY FIRST LEVEL COST ELEMENTS IN THOUSANDS OF FY80 DOLLARS

TYPE	CLASS	HULL	SHIP-YEARS	# OFF	# ENL	1.DIRECT COSTS	2.INTER MAINT	3.DEPOT MAINT	4.REC INVEST	5.INDIR COSTS	TOTAL O&S
TAO	105	****	0	0	0	0	0	0	0	0	0
TAO	105	105	0	0	0	0	0	0	0	0	0
TAO	105	105	FY77	0	0	0	0	0	0	0	0
TAO	105	105	FY78	0	0	0	0	0	0	0	0
TAO	105	105	FY79	0	0	0	0	0	0	0	0
TAO	105	106	0	0	0	0	0	0	0	0	0
TAO	105	106	FY77	0	0	0	0	0	0	0	0
TAO	105	106	FY78	0	0	0	0	0	0	0	0
TAO	105	106	FY79	0	0	0	0	0	0	0	0
TAO	105	107	0	0	0	0	0	0	0	0	0
TAO	105	107	FY77	0	0	0	0	0	0	0	0
TAO	105	107	FY78	0	0	0	0	0	0	0	0
TAO	105	107	FY79	0	0	0	0	0	0	0	0
TAO	105	108	0	0	0	0	0	0	0	0	0
TAO	105	108	FY77	0	0	0	0	0	0	0	0
TAO	105	108	FY78	0	0	0	0	0	0	0	0
TAO	105	108	FY79	0	0	0	0	0	0	0	0
TAO	105	109	0	0	0	0	0	0	0	0	0
TAO	105	109	FY77	0	0	0	0	0	0	0	0
TAO	105	109	FY78	0	0	0	0	0	0	0	0
TAO	105	109	FY79	0	0	0	0	0	0	0	0
TAO	143	****	6	15	289	5637	142	4908	56	163	10908
TAO	143	143	1	15	291	6366	288	432	21	228	7336
TAO	143	143	FY77	15	291	6366	288	432	21	228	7336
TAO	143	143	FY78	0	0	0	0	0	0	0	0
TAO	143	143	FY79	0	0	0	0	0	0	0	0
TAO	143	144	0	0	0	0	0	0	0	0	0
TAO	143	144	FY77	0	0	0	0	0	0	0	0
TAO	143	144	FY78	0	0	0	0	0	0	0	0
TAO	143	144	FY79	0	0	0	0	0	0	0	0

*** VAMOSC-SHIPS O&S DATA ***

SHIP TYPE, CLASS AND HULL AVERAGES PLUS INDIVIDUAL SHIP O&S COSTS
FOR FY77-FY78-FY79 BY FIRST LEVEL COST ELEMENTS IN THOUSANDS OF FY80 DOLLARS

TYPE	CLASS	HULL	SHIP-YEARS	# OFF	# ENL	1.DIRECT COSTS	2.INTER MAINT	3.DEPOT MAINT	4.REC INVEST	5.INDIR COSTS	TOTAL O&S
TAO	143	145	2	15	285	5986	66	5917	32	165	12167
TAO	143	145	FY77	15	281	5810	92	11372	37	221	17533
TAO	143	145	FY78	15	289	6162	40	462	27	110	6802
TAO	143	145	FY79	0	0	0	0	0	0	0	0
TAO	143	146	3	15	291	5162	144	5727	84	140	11260
TAO	143	146	FY77	15	288	6535	102	8872	5	214	15730
TAO	143	146	FY78	15	297	3938	153	4840	226	112	9270
TAO	143	146	FY79	15	289	5014	177	3470	23	96	8782

APPENDIX C

This appendix presents fuel delivery cost equations and calculations.

Current Delivery Cost

Oiler Equation: [(Average Annual Acquisition Cost) + (Average Annual O&S Cost)] [DFM % of Total POL] [Number of Oilers]

AO: [(3.355) + (14.637)] [78%] [5]

= [17.992] [78%] [5]

= $70.169M

TAO: [(2.522) + (20.586)] [72%] [11]

= [23.108] [72%] [11]

= $183.015M

Escort Equation: [(Average Annual Acquisition) + (Average Annual O&S Cost)] [Composite DFM % of Total POL] [Number of Escorts Per Oiler] [Number of Oilers]

= [(2.243) + (9.242)] [73%] [.75] [16]

= [11.485] [73%] [.75] [16]

= $100.609M

Total $ 70.169 + 183.015 + 100.609

Delivery cost $353.793M

Fuel Delivery Quantities

Equation: (Average Annual Deliveries) (Number of Oilers)

AO: (275.3K bbls) (5)

= 1.376M bbls

TAO: (767.7 K bbls) (11)

= 8.445M bbls

TOTAL: 1.376M + 8.445M

= 9.821M bbls

Current Delivery Cost per Barrel for Escorted UNREP Oiler

Equation: (Total Delivery Cost) ÷ (Total Delivery Quantity)

($353.793M) (9.821M bbls)

= $36.02/bbl

Current Normalized Fuel Delivery Cost

Equation: (Current UNREP Delivery Cost) . (UNREP Fuel Delivery Percent)

($36.02/bbl) (70%)

= $25.21/bbl

Future Delivery Cost

AO 177 (5.8 + 14.5) (60%) (1)

= (20.3) (60%) (1)

= $12.18M

FFG 7 (7.5 + 8.3) (60%) (.75) (1)

= (15.8) (60) (.75) (1)

= $7.11M

Total Future Delivery Cost

12.18 + 7.11

= $19.29M

Future Delivery Cost per Barrel for Escorted UNREP Oiler

($19.29M) ÷ (.288M bbls)

= $66.98/bbl

Future Normalized Fuel Delivery Cost

($66.98) (.7) = $46.89/bbl

Total Normalized Delivery Cost

$$\left[\left(\begin{matrix}\text{Current}\\ \text{Delivery}\\ \text{Cost}\end{matrix}\right) + \left(\begin{matrix}\text{Future}\\ \text{Delivery}\\ \text{Cost}\end{matrix}\right)\right] \div 2$$

= (25.21 + 46.89) ÷ 2 = $36.05/bbl